

CLAIMS

1. A selector valve comprising:
 - a housing having a cylinder hole;
 - a valve element capable of entering said cylinder hole of said housing and moving in an axial direction of said cylinder hole, a first end of said valve element entered in said cylinder hole being seated on/unseated from a valve seat on said housing side, said valve element receiving such an operating force in a second end on an opening side of said cylinder hole opposite to said first end as making said first end seat on said valve seat;
 - a valve spring for exerting a returning force for returning said valve element in an opposite direction of said operating force;
 - a first port located at the depth of said cylinder hole; and
 - a second port located near the opening of said cylinder hole from said first port,

said valve being opened and closed by making said first end of said valve element seat on/unseat from said valve seat according to the presence or absence of said operating force received in said second end of said valve element,

said selector valve capable of maintaining a closed position further including the following features,

 - (A) said valve element is formed in a stepped structure, and receives a force based on a difference in pressure receiving area by said stepped structure which results from the pressure of hydraulic fluid flowing through said first and second ports, and
 - (B) a seating state of said valve element seated on said valve seat is maintainable by force based on a difference in pressure receiving area by said stepped structure of said valve element when said first end of said valve element is seated on said valve seat on said housing side.

2. A selector valve according to claim 1, wherein said valve element includes an enlarged-diameter part on the side facing said first port and a reduced-diameter part near the opening of said cylinder hole, said valve element further including an internal path for communicating said reduced-diameter part of said first port and an outer periphery of said reduced-diameter part with each other through an inner peripheral part of the part seated on said valve seat.

3. A selector valve according to claim 1, wherein said valve element includes an outer piston having an inner hole along said axial direction and an inner piston fitted to the inner hole of said outer piston such that said inner piston is movable within the inner hole of said outer piston, and said valve spring includes a main spring for exerting a returning force to said outer piston and a secondary spring for exerting a returning force to said inner piston.

4. A knee torque device for exerting a resisting force to flexing of a knee, comprising a first chamber into which a hydraulic oil flows when the knee is extended, a second chamber into which a hydraulic oil flows when the knee is flexed, a path for communicating said second and first chambers with each other, a restrictor located between said first and second chambers on said path and adapted to exert a resisting force to flexing of the knee making good use of a flow resistance of said hydraulic oil passing through said restrictor, a check valve connected to said restrictor in parallel on said path and adapted to prevent a flow of said hydraulic oil from said first chamber to said second chamber but allow a flow in the opposite direction, and a selector valve connected to said check valve and said restrictor in parallel on said path and opened/closed by receiving a load of a wearer of said knee torque device, said selector valve including the following constructions and features,

(a) a housing having a cylinder hole;

(b) a valve element capable of entering said cylinder hole of said housing and moving in an axial direction of said cylinder hole, a first end of said valve element entered in said cylinder hole being seated on/unseated from a valve seat on said housing side, said valve element receiving such an operating force in a second end on an opening side of said cylinder hole opposite to said first end as making said first end seat on said valve seat;

(c) a valve spring for exerting a returning force for returning said valve element in an opposite direction of said operating force;

(d) a first port located at the depth of said cylinder hole;

(e) a second port located near the opening of said cylinder hole from said first port;

(f) said selector valve receiving an operating force at said second end of said valve element when said selector valve receives a load of a wearer of said knee torque device;

(g) said valve being opened and closed by making said first end of said valve element seat on/unseat from said valve seat according to the presence or absence of said operating force received in said second end of said valve element,

(A) said valve element being formed in a stepped structure, and receiving a force based on a difference in pressure receiving area by said stepped structure which results from the pressure of hydraulic fluid flowing through said first and second ports, and

(B) a seating state of said valve element seated on said valve seat being maintainable by force based on a difference in pressure receiving area by said stepped structure of said valve element when said first end of said valve element is seated on said valve seat on said housing side.

5. A knee torque device according to claim 4, wherein said force based on a difference in pressure receiving area is capable of maintaining a state where said valve element is made to seat on said valve seat by overcoming

the returning force of said valve spring when the pressure on said first port side is a predetermined value or more.

6. A knee torque device according to claim 4, wherein said first and second chambers are divided by a vane pivotable about one point or a piston reciprocally movable in a linear direction.

7. A knee torque device according to claim 4, wherein said selector valve is of a normally closed type or a normally open type.

8. An artificial leg including a knee torque device of claim 4.

9. An artificial leg according to claim 8, wherein said knee torque device is such designed that a knee joint can be bent by an own load of a wearer of said artificial leg when said artificial leg is in a swing phase, and said artificial leg further includes an air cylinder device for assisting the flexing and extending of the knee in a swing phase.